

REMARKS

Claims 26 and 28-78 are pending in the application.

Claims 26, 28, 37, 31, and 78 stand rejected under 35 U.S.C. § 112 as being indefinite. Applicant requests reconsideration. Page 2 of the Office Action alleges that claim 26 is indefinite regarding whether the conductive barrier layer prevents oxygen diffusion or enhances oxygen diffusion.

Applicant asserts that the express terms of claim 26 are clear in setting forth a “conductive barrier layer to oxygen diffusion” that prevents diffusion, as supported by page 10, lines 16-23 and elsewhere throughout the present specification. Accordingly, no amendment of claim 26 is warranted. As may be appreciated after review of claims 28, 37, 31, and 78, the express terms of such claims are also similarly clear. Applicant requests withdrawal of the indefiniteness rejection in the next Office Action.

Claims 26, and 28-78 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuzumi in view of Kim. Applicant requests reconsideration.

Claim 26 sets forth a capacitor construction that includes, among other features, a capacitor dielectric layer over a first electrode, a second capacitor electrode over the dielectric layer, and an atomic layer deposited conductive barrier layer to oxygen diffusion between the first and second electrodes. The dielectric layer is over the barrier layer. Pages 3-4 of the Office Action allege that Fukuzumi discloses every limitation of claim 26 except for the atomic layer deposited conductive barrier layer to oxygen diffusion and relies

upon Kim as allegedly disclosing the missing subject matter. Applicant traverses.

Page 3 of the Office Action states that metal film 52 of Fukuzumi discloses a conductive barrier layer to oxygen diffusion. However, as may be appreciated from page 12, lines 3-7 and elsewhere throughout the present specification, merely forming a metal film does not necessarily constitute forming a barrier layer to oxygen diffusion. Instead, depending upon material properties, at least thickness and density of a metal film may influence whether such film is sufficient to constitute a barrier layer to oxygen diffusion.

Review of Fukuzumi does not reveal any discussion of oxygen diffusion. Applicant acknowledges the discussion in column 15, lines 24-30 of Fukuzumi regarding formation of a conductive oxide at a contact portion between a capacitor electrode and dielectric film. However, such discussion clearly does not address diffusion of oxygen through metal film 52. Fukuzumi does not disclose or suggest any considerations addressing forming metal film 52 in a manner such that it necessarily constitutes a barrier layer to oxygen diffusion. A person of ordinary skill viewing the teachings of Fukuzumi cannot conclude that metal film 52 necessarily constitutes a barrier layer to oxygen diffusion.

The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency. Instead, some basis in fact and/or technical reasoning must exist to reasonably support the determination that the allegedly inherent characteristic necessarily flows from

the teachings of the applied prior art. No requirement exists that metal film 52 necessarily constitutes a barrier layer to oxygen diffusion. At least for such reason, Applicant asserts that Fukuzumi does not disclose or suggest metal film 52 as a barrier layer to oxygen diffusion.

Page 4 of the Office Action alleges that Kim discloses forming a conductive barrier layer using ALD. However, in this regard, Applicant asserts that Kim fails to remedy the deficiencies of Fukuzumi discussed above. Applicant notes that the problem confronted by the inventor must be considered in determining whether it would have been obvious to combine references in order to solve such problem. If the references do not address or even recognize the problem, then they cannot begin to teach or suggest a solution to it. Neither Fukuzumi nor Kim address the problem of oxygen diffusion solved by Applicant's invention and, accordingly, cannot suggest a solution to such problem.

The Office Action relies upon Kim as allegedly disclosing forming metal film 52 by ALD. However, column 1, lines 8-10 and column 4, lines 8-11 reveal that Kim only addresses formation of a dielectric film by ALD. At least for such reason, Applicant asserts that no suggestion or motivation exists in the prior art to form metal film 52 of Fukuzumi using the dielectric film ALD methods of Kim.

In addition, Applicant asserts that Kim cannot be considered to disclose or suggest any considerations that will necessarily result in metal film 52 constituting a barrier layer to oxygen diffusion. Kim discloses an Al_2O_3

dielectric film thickness of about 70 Angstroms in column 5, lines 36-39. Even so, such description does not constitute disclosure of a conductive barrier layer thickness and density sufficient to address oxygen diffusion, such as discussed on page 12, lines 3-7 of the present specification. Thus, neither Fukuzumi nor Kim provide any teaching that metal film 52 of Fukuzumi or the ALD film of Kim are sufficient to produce the atomic layer deposited conductive barrier layer to oxygen diffusion set forth in claim 26.

Page 4 of the Office Action alleges that a conductive barrier layer formed over a capacitor electrode for suppression of leakage current inherently inhibits oxygen diffusion into the electrode. However, as established above, such a conclusion is erroneous. First, the leakage current inhibition described in Kim occurs by virtue of a dielectric layer thickness, not by virtue of a conductive barrier layer thickness. The Office Action does not identify any support in the prior art for the allegation that inhibiting leakage current necessarily results in reducing oxygen diffusion. Second, Kim fails to recognize any of the considerations set forth in the present specification that determine whether a conductive barrier layer addresses oxygen diffusion. The deficiency of Kim partly results from failure to recognize the problem resolved by the method of claim 26 and partly from failure to teach ALD of a barrier layer. It follows that no basis in fact and/or technical reasoning necessarily flows from the teachings of Kim to inherently produce a conductive layer that addresses oxygen diffusion, as set forth in claim 26.

In keeping with the statements above, Applicant asserts that neither Fukuzumi nor Kim disclose or suggest a conductive barrier layer to oxygen diffusion. Also, Kim fails to disclose or suggest ALD of a barrier layer, contrary to the allegation in the Office Action. At least for such reason, Fukuzumi in view of Kim fails to disclose or suggest every limitation of claim 26. Claims 28-30, 34, 35, and 50-56 depend from claim 26 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested.

For example, claim 28 sets forth another conductive barrier layer to oxygen diffusion over the dielectric layer. Fukuzumi and Kim do not disclose or suggest and the Office Action does not allege that they disclose or suggest the subject matter of claim 28. Review of both references does not reveal any teaching of another conductive barrier layer to oxygen diffusion.

Also, for example, claims 52, 53, and 56 set forth that the barrier layer contains TiN. Applicant acknowledges a discussion in column 8, line 37 of Kim regarding a lengthy list of materials to which the Kim method applies. However, merely listing TiN as a material does not constitute disclosure or suggestion to replace metal film 52 of Fukuzumi with TiN. The mere fact that the prior art can be modified does not make the modification obvious unless the prior art suggested the desirability of the modification. No support exists in Fukuzumi, Kim, or the Office Action for the desirability of replacing metal film 52 with a metal nitride film. Any proposed modification of the prior art

that renders the prior art device or process inoperable for its intended purpose does not constitute a valid suggestion to modify the reference.

Claim 31 sets forth a capacitor construction that includes, among other features, a conductive barrier layer to oxygen diffusion over a first electrode, a capacitor dielectric layer over the barrier layer, and a second capacitor electrode over the dielectric layer. The barrier layer includes a chemisorption product of first and second precursor layers. Pages 3-4 of the Office Action allege that Fukuzumi discloses every limitation of claim 31 except for the conductive barrier layer to oxygen diffusion that includes a chemisorption product of first and second precursor layers. The Office Action relies upon Kim as allegedly disclosing the missing subject matter. As may be appreciated from the above discussion regarding the deficiencies of Fukuzumi in view of Kim as applied to claim 26, Applicant asserts that the cited combination fails to disclose or suggest the claimed chemisorption product of first and second precursor layers contained in a conductive barrier layer.

Claims 32, 33, 36, and 57-63 depend from claim 31 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claims 59, 60, and 63 set forth that the barrier layer contains TiN. As may be appreciated from the discussion above regarding patentability of claims 52, 53, and 56, respective claims 59, 60, and 63 are patentable.

Claim 37 sets forth a capacitor construction that includes, among other features, a conductive barrier layer to oxygen diffusion over a first electrode, a capacitor dielectric layer over the barrier layer, and a second capacitor electrode over the dielectric layer. The barrier layer contains Pd or Pd alloys as a chemisorption product of first and second precursor layers. As may be appreciated from the discussion above regarding the deficiencies of Fukuzumi in view of Kim as applied to claim 26, the cited combination fails to disclose or suggest the claimed chemisorption product of first and second precursor layers contained in conductive barrier layer.

Claim 38 sets forth a capacitor construction including, among other features, a capacitor dielectric layer over a first electrode, a second capacitor electrode over the dielectric layer, and an atomic layer deposited metal-containing conductive layer between the first electrode and dielectric layer. As may be appreciated from the above discussion regarding the deficiencies of Fukuzumi in view of Kim as applied to claim 26, the cited combination fails to disclose or suggest the atomic layer deposited metal-containing conductive layer, as set forth in claim 38.

Specifically, the cited combination fails to disclose or suggest a motivation to modify Fukuzumi by replacing metal film 52 with an ALD metal nitride or conductive metal oxide such as listed in column 8 of Kim. No support exists for the proposition that the material of Kim will provide the essential functions of metal film 52 required by Fukuzumi. Claims 39-42 and 64-70 depend from claim 38 and are patentable at least for such reason as

well as for the additional limitations of such claims not disclosed or suggested. For example, claims 66, 67, and 70 set forth that the conductive layer contains TiN. Fukuzumi in view of Kim cannot be considered to disclose or suggest replacing metal film 52 with TiN at least for the reasons discussed above with regard to claims 52, 53, and 56.

Claim 43 sets forth a capacitor construction that includes, among other features, a layer of metal-containing conductive material over a first electrode, a capacitor dielectric layer over the conductive layer, and a second capacitor electrode over the dielectric layer. The conductive material includes a chemisorption product of first and second precursor layers. As may be appreciated from the above discussion regarding the deficiencies of Fukuzumi in view of Kim as applied to claim 26, the cited combination fails to disclose or suggest the chemisorption product contained in a layer of metal-containing conductive material, as set forth in claim 43.

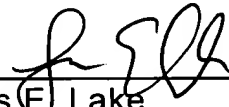
Specifically, the cited combination fails to disclose or suggest replacing metal film 52 of Fukuzumi with ALD metal nitride or conductive metal oxide such as listed in column 8 of Kim. Claims 44-49 and 71-77 depend from claim 40 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claims 73, 74, and 77 set forth that the conductive layer includes TiN. Fukuzumi in view of Kim cannot be considered to disclose or suggest replacing metal film 52 with TiN as may be appreciated from the above discussion regarding claims 52, 53, and 56.

Applicant herein establishes adequate reasons supporting patentability of claims 26 and 28-78 and requests allowance of all such pending claims in the next Office Action.

Respectfully submitted,

Dated: 16 Mar 2005

By: _____


James E. Lake
Reg. No. 44,854